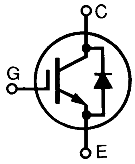
IXYS

Low $V_{CE(sat)}$ IGBT with Diode
High Speed IGBT with Diode

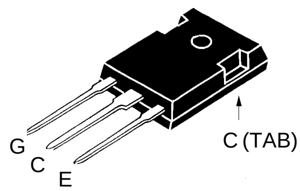
Combi Pack

	V_{CES}	I_{C25}	$V_{CE(sat)}$
IXGH 12N100U1	1000 V	24 A	3.5 V
IXGH 12N100AU1	1000 V	24 A	4.0 V



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1000	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	1000	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	24	A
I_{C90}	T_C = 90°C	12	A
I_{CM}	T_C = 25°C, 1 ms	48	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 150 Ω Clamped inductive load, L = 300 µH	I_{CM} = 24 @ 0.8 V_{CES}	A
P_C	T_C = 25°C	100	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque with screw M3	1.13/10	Nm/lb.in.
Weight		6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

TO-247AD



G = Gate　　C = Collector
E = Emitter　　TAB = Collector

Symbol	Test Conditions (T_J = 25°C, unless otherwise specified)		Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 3 mA, V_{GE} = 0 V		1000			V
	BV_{CES} temperature coefficient			0.072		%/K
$V_{GE(th)}$	I_C = 500 µA, V_{CE} = V_{GE}		2.5		5.5	V
	$V_{GE(th)}$ temperature coefficient			-0.192		%/K
I_{CES}	V_{CE} = 0.8, V_{CES}	T_J = 25°C			300	µA
	V_{GE} = 0 V	T_J = 125°C			5	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{CE90}, V_{GE} = 15	12N100U1			3.5	V
		12N100AU1			4.0	V

Features
- International standard packages JEDEC TO-247
- IGBT with antiparallel FRED in one package
- HDMOS™ process
- Low $V_{CE(sat)}$
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
  - soft recovery with low I_{RM}

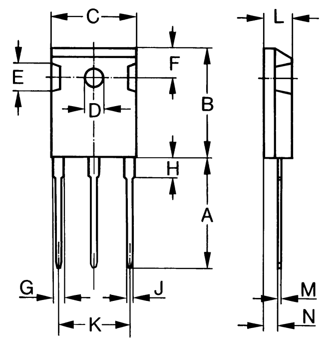
Applications
- DC choppers
- AC motor speed control
- DC servo and robot drives
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

Advantages
- Easy to mount with one screw
- Reduces assembly time and cost
- Space savings (two devices in one package)

IXYS reserves the right to change limits, test conditions, and dimensions.　　95596C (7/00)

Symbol	Test Conditions (T_J = 25°C, unless otherwise specified)		Characteristic Values Min.	Typ.	Max.	
g_{fs}	$I_C = I_{C90}$; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %		6	10		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1MHz			750		pF
C_{oes}				120		pF
C_{res}				30		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}			65	90	nC
Q_{ge}				8	20	nC
Q_{gc}				24	45	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**			100		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 300 µH			200		ns
$t_{d(off)}$	V_{CE} = 800 V, $R_G = R_{off}$ = 120 Ω			850	1000	ns
t_{fi}	Remarks: Switching times may	12N100U1		800	1000	ns
	increase for V_{CE} (Clamp) > 0.8 V_{CES},	12N100AU1		500	700	ns
E_{off}	higher T_J or increased R_G	12N100U1		2.5		mJ
		12N100AU1		1.5	3.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**			100		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 300 µH			200		ns
$E_{(on)}$	V_{CE} = 800 V, $R_G = R_{off}$ = 120 Ω			1.1		mJ
$t_{d(off)}$	Remarks: Switching times may			900		ns
t_{fi}	increase for V_{CE} (Clamp) > 0.8 V_{CES},	12N100U1		1250		ns
	higher T_J or increased R_G	12N100AU1		950		ns
E_{off}		12N100U1		3.5		mJ
		12N100AU1		2.2		mJ
R_{thJC}					1.25	K/W
R_{thCK}				0.25		K/W

TO-247 AD (IXGH) Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	19.81	20.32	0.780	0.800
B	20.80	21.46	0.819	0.845
C	15.75	16.26	0.610	0.640
D	3.55	3.65	0.140	0.144
E	4.32	5.49	0.170	0.216
F	5.4	6.2	0.212	0.244
G	1.65	2.13	0.065	0.084
H	-	4.5	-	0.177
J	1.0	1.4	0.040	0.055
K	10.8	11.0	0.426	0.433
L	4.7	5.3	0.185	0.209
M	0.4	0.8	0.016	0.031
N	1.5	2.49	0.087	0.102

Reverse Diode (FRED) (T_J = 25°C, unless otherwise specified)

Symbol	Test Conditions		Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 8A, V_{GE} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %				2.75	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 100 A/µs			6.5		A
t_{rr}	V_R = 540 V	T_J = 125°C		120		ns
	I_F = 1 A, -di/dt = 50 A/µs, V_R = 30 V	T_J = 25°C		50	60	ns
R_{thJC}					2.5	K/W

IXYS MOSFETS and IGBTs are covered by one or more of the following U.S. patents:
4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

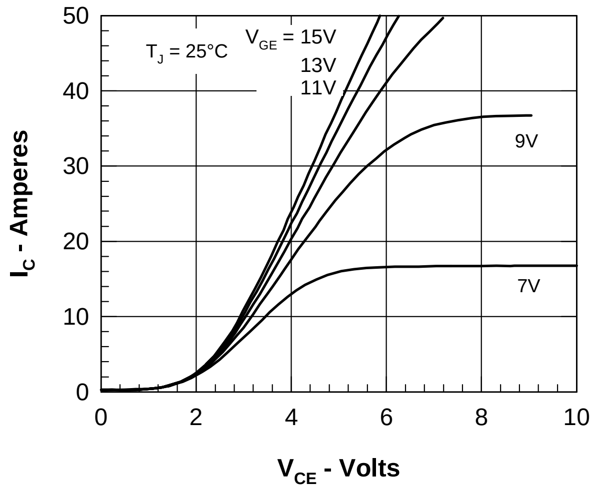


Figure 1. Saturation Voltage Characteristics

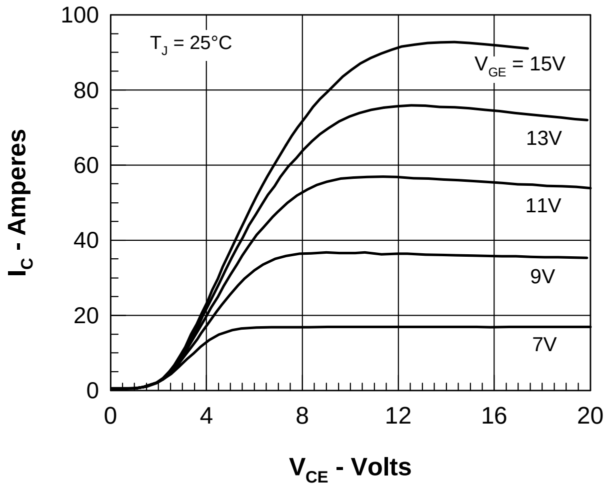


Figure 2. Extended Output Characteristics

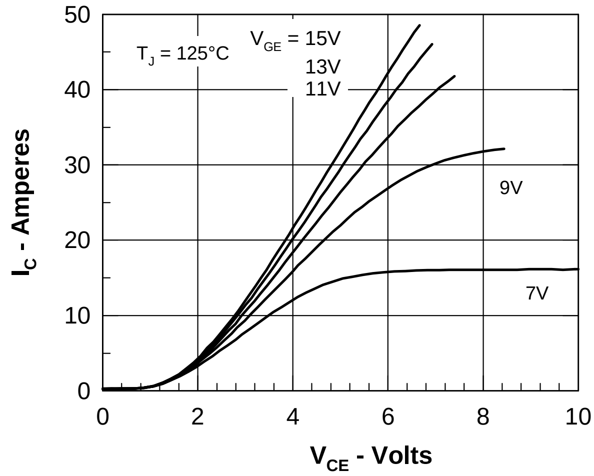


Figure 3. Saturation Voltage Characteristics

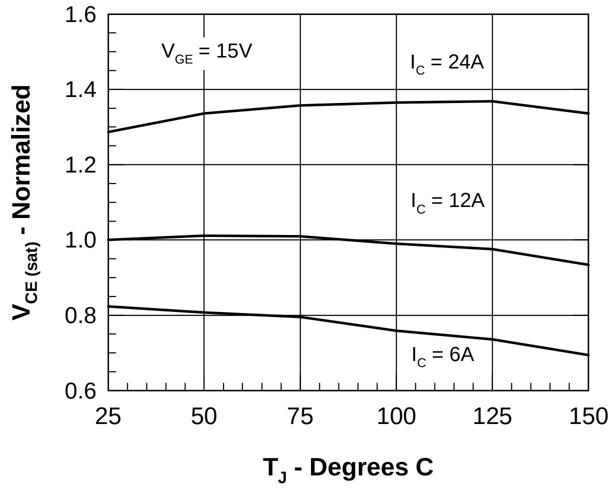


Figure 4. Temperature Dependence of $V_{CE(sat)}$

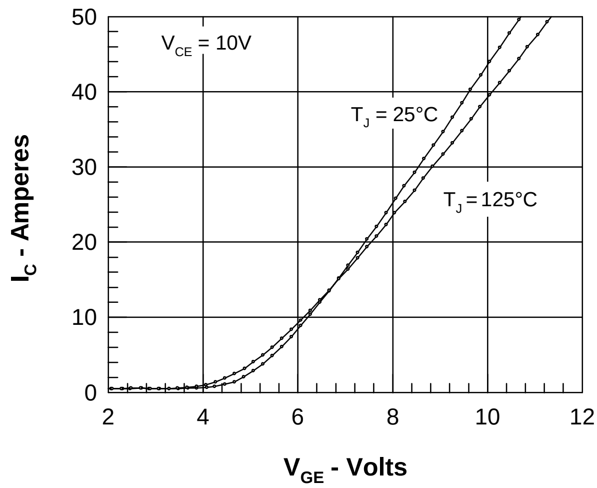


Figure 5. Admittance Curves

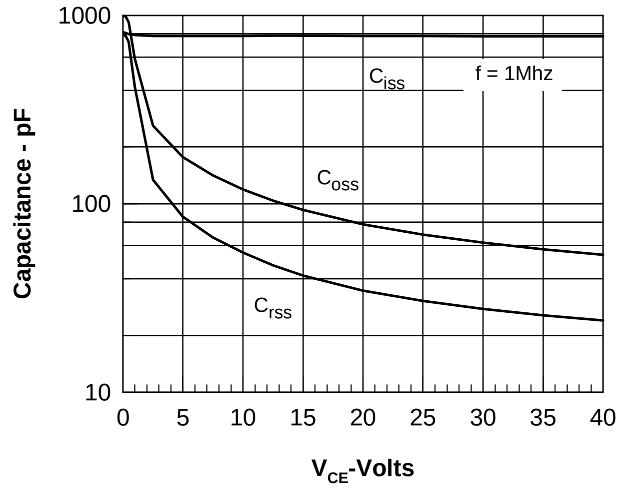


Figure 6. Capacitance Curves

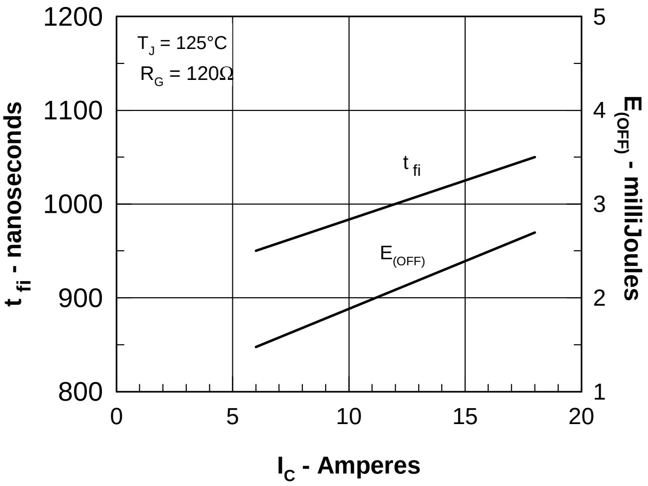


Figure 7. Dependence of tfi and E_{OFF} on I_C.

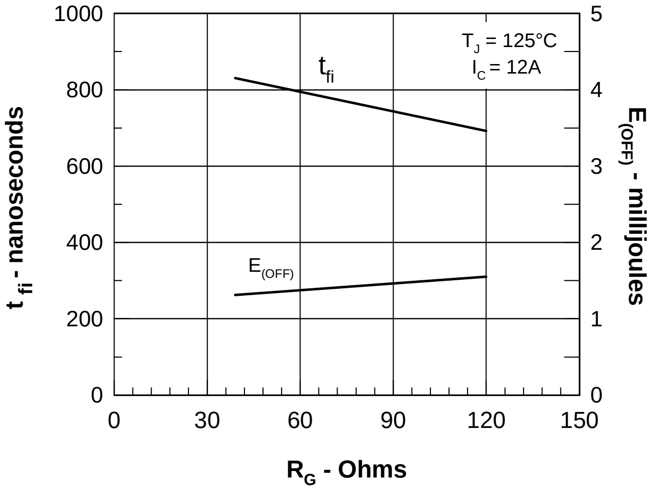


Figure 8. Dependence of tfi and E_{OFF} on R_G.

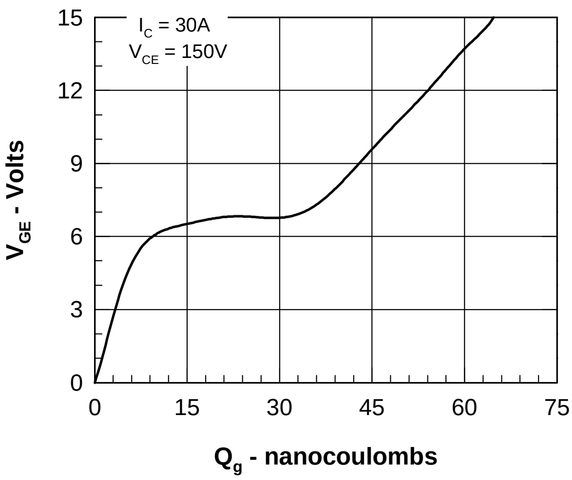


Figure 9. Gate Charge

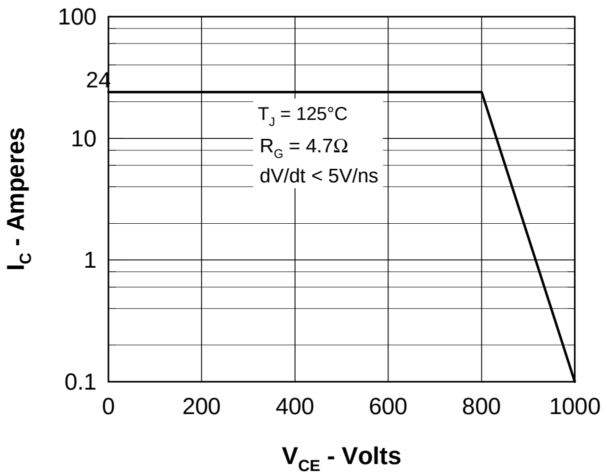


Figure 10. Turn-off Safe Operating Area

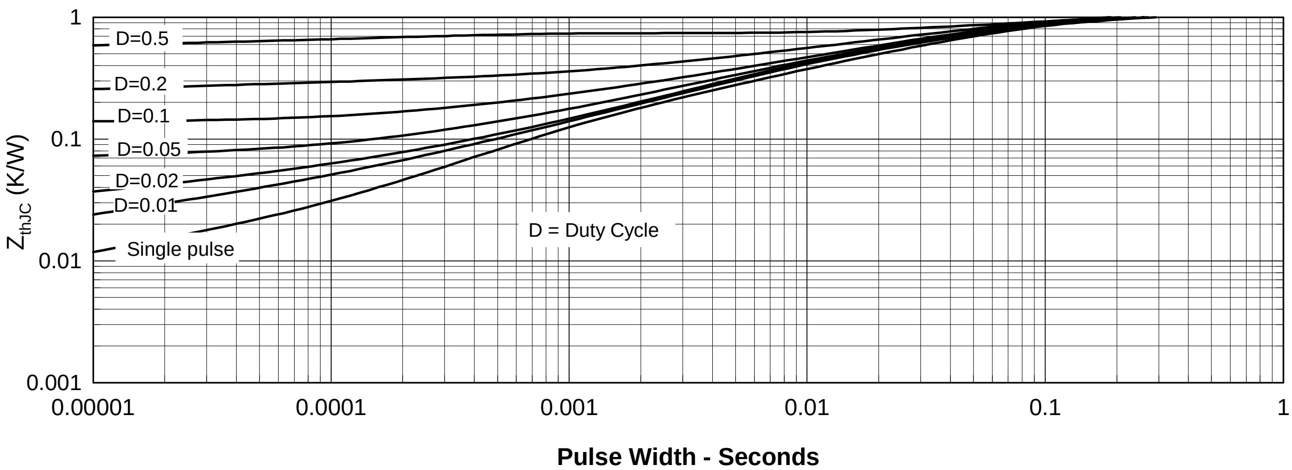


Figure 11. Transient Thermal Resistance

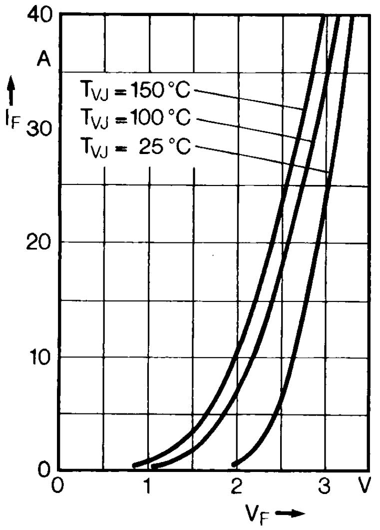


Fig. 12. Forward current versus voltage drop.

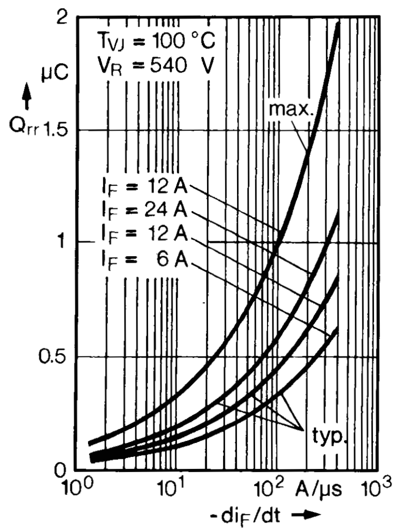


Fig. 13. Recovery charge versus $-di_F/dt$.

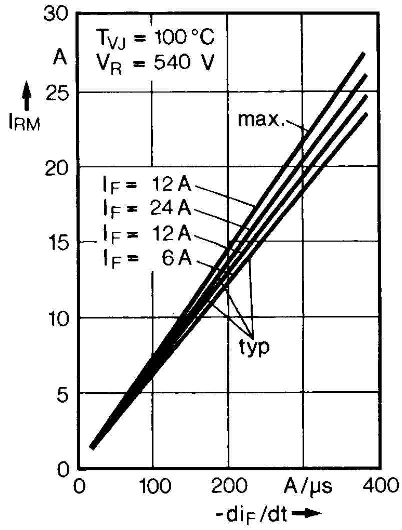


Fig. 14. Peak reverse current versus $-di_F/dt$.

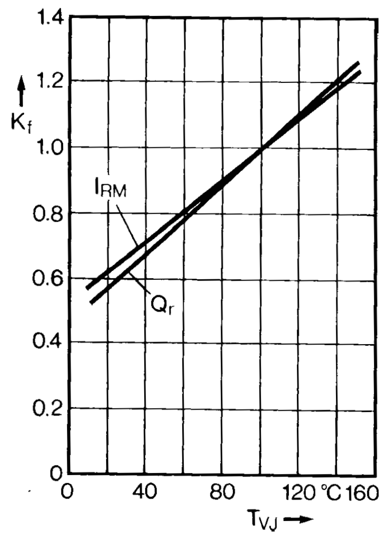


Fig. 15. Dynamic parameters versus junction temperature.

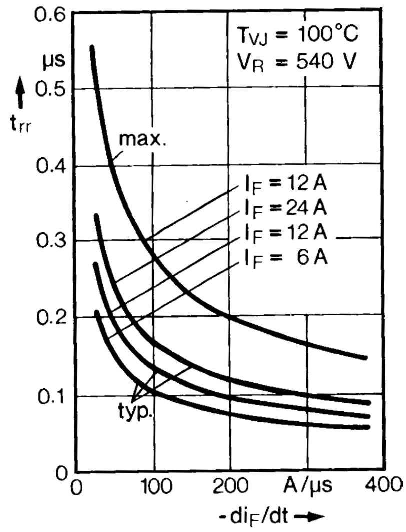


Fig. 16. Reverse recovery time . versus $-di_F/dt$

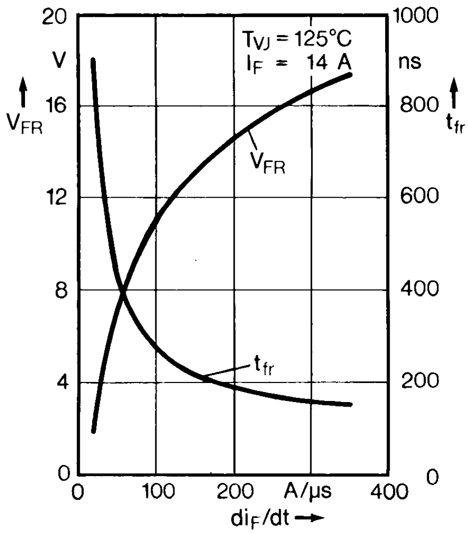


Fig. 17. Forward voltage recovery and time versus $-di_F/dt$.

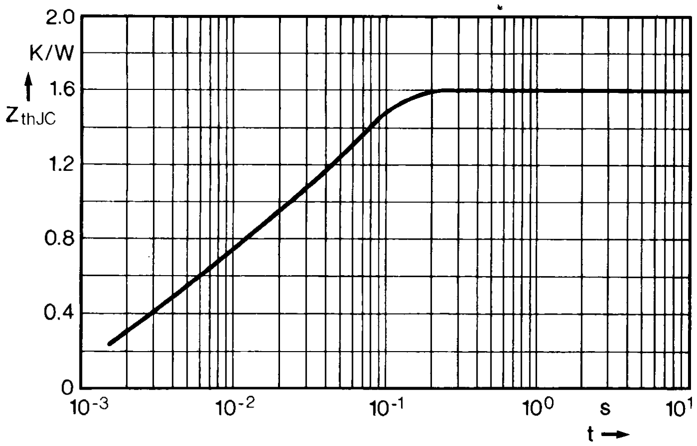


Fig. 18. Transient thermal impedance junction to case.